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PERSPECTIVES ON ICT ADOPTION IN UGANDAN SCHOOLS

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To Charles

TABLE OF CONTENTS

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DEFINITIONS

Practical-	Laboratory assignment or demonstration by an instructor
Remedial-	Lessons held before or after school, or weekends, covering both old and new material. Teachers are paid extra to instruct remedial lessons.
SESEMAT-	Acronym meaning Secondary School Science and Mathematics Training. The Ministry of Education and Sports created it to combat low test scores on the S4 leaving exam in science and math. The program included different methods of instruction and an emphasis on using technology.
USEP-	Acronym meaning Ugandan Science Education Program. This program was run by an NGO sponsored by the Catholic Church. It ran a science and technology promotion program for Catholic schools, which St. Theresa S.S. Okunguro participated in.

LIST OF ABBREVIATIONS

ICT	Information and Communication Technologies
LRA	Lord's Resistance Army
MOES	Ministry of Education and Sports
NGO	Non Governmental Organization
NRA	National Resistance Army
NRM	National Resistance Movement
PhET	Physics Education Technology
PLE	Primary Leaving Examination
PTA	Parent Teacher Association
SESEMAT	Secondary School Science and Mathematics Training
UACE	Ugandan Advanced Certification Examination
UCC	Uganda Communication Commission
UCE	Ugandan Certification Examination
UNEB	Ugandan National Examination Board
UPE	Universal Primary Education
UPS	Uninterrupted Power Supply
USE	Universal Secondary Education
USEP	Uganda Science Education Program

ABSTRACT

This report discusses steps for the integration and adoption of information and communication technologies (ICT) in Uganda schools. Barriers of ICT adoption for teachers were determined through surveys at three schools in Eastern Uganda. Teachers identified lack of familiarity of ICT resources and lack of ICT skills as the two greatest barriers to ICT integration. Administrators and staffs were also interviewed to determine current resources. Through observations, interviews and collected data the report addresses two major ideas, promoting utilization of ICT resources and development of sustainable ICT programs. Promotion of utilization not only relies on overcoming the major barriers listed, but also developing a positive attitude of ICT. Sustainability is an issue reliant on all three groups of the school community; administration, staff and users.

CHAPTER 1- INTRODUCTION

Uganda faces many challenges in the coming years, but education in Uganda faces a new challenge in particular. In recognition of the growing importance of technology and accepting the need to have a computer literate population the Ministry of Education and Sports in Uganda has made a significant push to create computer labs and a computer curriculum in the schools. This initiative has been improving as the number of schools receiving equipment for computer labs increases. The country and schools lack the information of how to successfully handle this transition. No outline is available for involving the schools staff, students and administration. Schools also lack technical skills and training for equipment use. It is a long step to the vision of how computers should be integrated into every day teaching.

Education in Uganda can be lauded for many progressive ideas in relation to their East African neighbors, and their emphasis on computers can be seen as another step in a forward direction. Current issues include teacher shortages, a lack of classrooms and desks at many schools, insufficient training for educators and administrators, as well as curriculum issues. However, Uganda's system of a national, free and relatively well-funded education system should be an example to other countries. Like any new initiative there will be some lingering growing pains in this process and unfortunately most will appear at the school level.

The Ugandan government understands some of the future needs of the country, but struggles to implement plans appropriately because of reoccurring problems like food security, health care availability and high population growth. Technology is a good example of foresight without full implementation. In teacher training colleges and at the universities, most teachers had some level of computer training. In many cases however, the teachers never actually touched a computer. They have hours of theoretical training but no practical experience with a computer.

Computer literate people are needed in the private sector. IT professionals take advantage of this situation. Simple processes like installing software come with a huge cost. They include licensing fees for free or pirated software and a charge per computer it is installed on. Without technical experts in the workplace simple tasks like word processing become complicated, while complicated tasks like maintenance become costly.

In Uganda my secondary project was working with my school in information and communication technology (ICT) issues. While I tried to get my school to integrate technology into lessons and expand their computer uses these background issues kept coming into play. Peace Corps tells volunteers that in Uganda every volunteer is going to work on HIV/AIDS programming, I believe everyone also does some level of computer and technology training as well. Every volunteer in a school could claim at least one semester where technology use became the emphasis in their work. Also a lot of ideas and information were shared at workshops and other Peace Corps trainings on what skills were important, good ideas for trainings and what programs were essential for schools.

While I was doing work for my school other volunteers in my community were also tackling this issue in their computer labs. One was at a Primary Teacher College while the other was at another secondary school I had frequent interaction with, and we constantly shared stories of encouragement, dismay and changes.

This report will provide a framework or guideline for schools that are going through the transition of integrating technology into their school. I want to develop a process to help schools prepare for technology implementation. This report aims to outline the issues to have in mind, which loom large over the success of this project. The goal is to increase the likelihood that school technology will be maintained by the school, used by the staff and students, and support education at the school. In the absence of such planning it is common for valuable resources to remain packed away, unused or neglected.

This report will look at two major themes: 1) promoting utilization and adoption of ICT materials, and 2) maintaining a sustainable management for ICT programs. First is the issue of technology use in the classrooms. This includes technology training for teachers, methods for promoting use with students and looking at factors, which increase performance like proper software, and integration with the curriculum. The second aspect is how to make the technology in the school successful and sustainable. School administrators and school boards must determine how resources will be used, how to fund future needs, and the direction of future projects.

Data was collected and analyzed from surveys administered at area schools about technology use in the schools by teachers. Direct interactions with administrators and teachers provide information along with other information gathered from projects in Uganda. Information and stories shared by other volunteers about their experiences in this arena were also incorporated. Some volunteers were involved in their schools' transition, being present as computers were delivered and installed where none had previously been, and can relate their schools steps in integrating this new resource. Techniques and ideas of project management and ownership within a locally run organization can be transferred to this scenario.

In order to frame it in terms of the Ugandan system I think the framework would best be summarized as important issues for utilization and sustainability involving administration, staff and users. All three of these groups have an investment in the school and are integral to the success of any project. This report, with its guidelines and strategies, can then be used to ensure these three groups understand the issues, communicate ideas for success within their school's framework and sustain a project that will benefit the students, school and community.

CHAPTER 2- CULTURAL CONTEXT

2.1 Teso Subregion

Two years of Peace Corps service and the majority of this study took place in Okunguro village, Bukedea District, Uganda (Figure 1.1). Bukedea District is one of a five Eastern Districts that comprise the Teso subregion, populated almost exclusively by the Iteso people. The Teso region has a rich history and the Iteso[1] people have come through many changes in their time since missionaries first settled in the region.

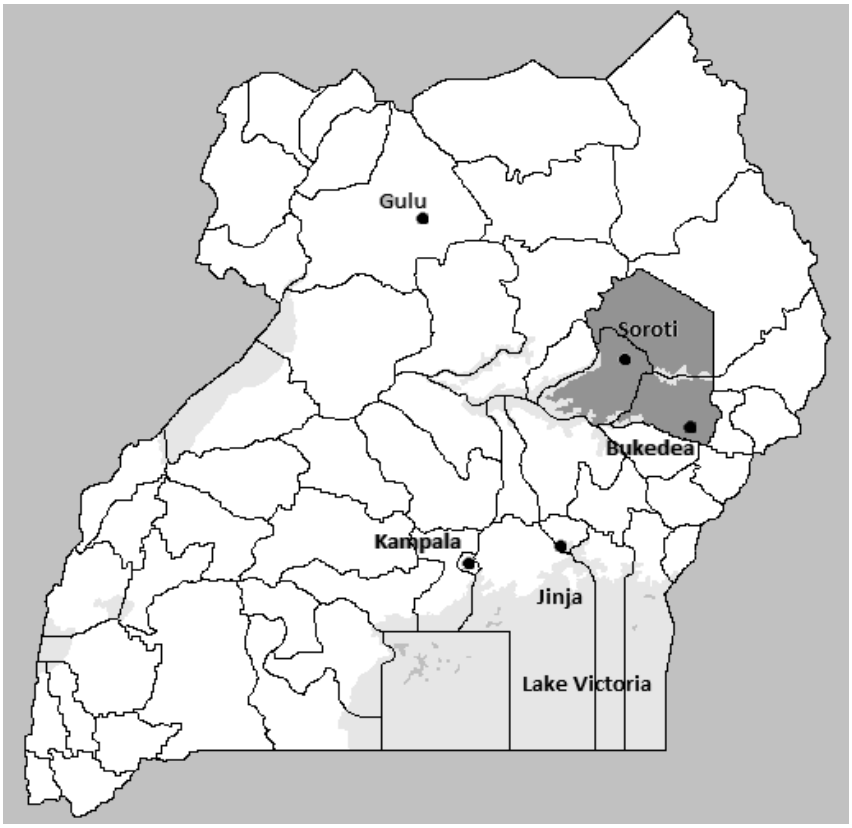

Figure 1.1: Teso Region in Uganda

[1] In the local language of Ateso the naming conventions are as follows: the basic identifier is the region people are from, in this instance, Teso. Having the letter "I" in front, Iteso, refers to people of the region and the language of the area is noted with an "a" leading the term, Ateso. In short, region is Teso, containing the Iteso people, who speak Ateso.

Teso was predominatly a cattle culture. Families looked after large herds of cows and practiced agriculture based on oxen. The men of the household tended the cattle and the women oversaw domestic responsibilities. The Iteso are closely related to other pastoralist tribes including the Maasi of Kenya and the Karimojong of Uganda and Kenya (Jones, 2005). Missionaries settled originally in Ngora, the center of Teso, and established schools and churches throughout the region. Catholics were predominant in the region, but Protestants were also present.

The large cattle herds gave the people of Teso great wealth and provided an interesting trend in the population; many people born in the 1950's are well-educated compare to other tribes in Uganda. Families were able to pay for school fees by selling cattle allowing more children to attend school. This led to a generation of well-educated Itesots who could afford to attend mission schools and even University. The move to independence in 1962 did little to change life in Teso until fall of Milton Obote in 1971 leading to the rise of Idi Amin.

While the country at large had a passage to one of its darkest time under the dictatorship of Idi Amin, the people of the Teso region again had little change to their lives. From 1971 to 1979 the economy of the country crumbled and the main cash crop in Teso, cotton, became devalued. Teso switched away from cash crops and began growing more subsistence crops including millet, sorghum, and cassava. They felt the decline as a nation, but their cattle herds and relative wealth remained intact (Jones, 2005).

Life began to change after the instability of the overthrow of Idi Amin in 1979. Political turmoil of seven years spilled into a civil war after Yoweri Museveni disputed the 1980 election and took an army into the bush, calling themselves the National Resistance Army (NRA). This war was fought almost exclusively in the Luwero Triangle, figure 1.2, north and west of the capital Kampala, but it opened avenues for other instability across the country, including in the East (Mirzeler & Young, 2000).

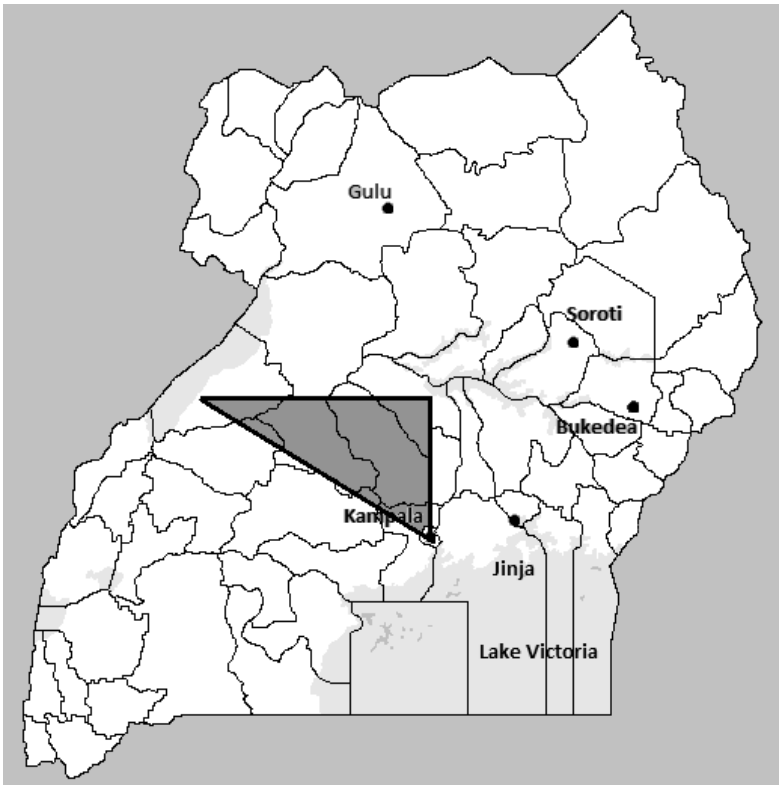

Figure 1.2: Luwero Triangle

The Karimojong, a tribal group whose people are spread from the Northern boarders with Sudan and Kenya down to the slopes of Mount Elgon, inhabit a mostly arid land, which can sustain almost no agriculture (Figure 1.3). They are relatives of the Iteso who split from them around 500 years ago during a southern migration. In Ateso, Karimojong means 'the old ones left behind,' those too old or tired to continue their journey south. They are culturally more militaristic than Itesots, and have a fierce cattle culture, including their underlying belief that all cows belong to the Karimojong (Mirzeler & Young, 2000). In order for a boy to make the transition to manhood he must lead a successful raid to capture cattle. These raids can happen between clans within the Karimojong, or outside the tribe. In the early 1980's Teso found themselves in the path of the Karimojong.

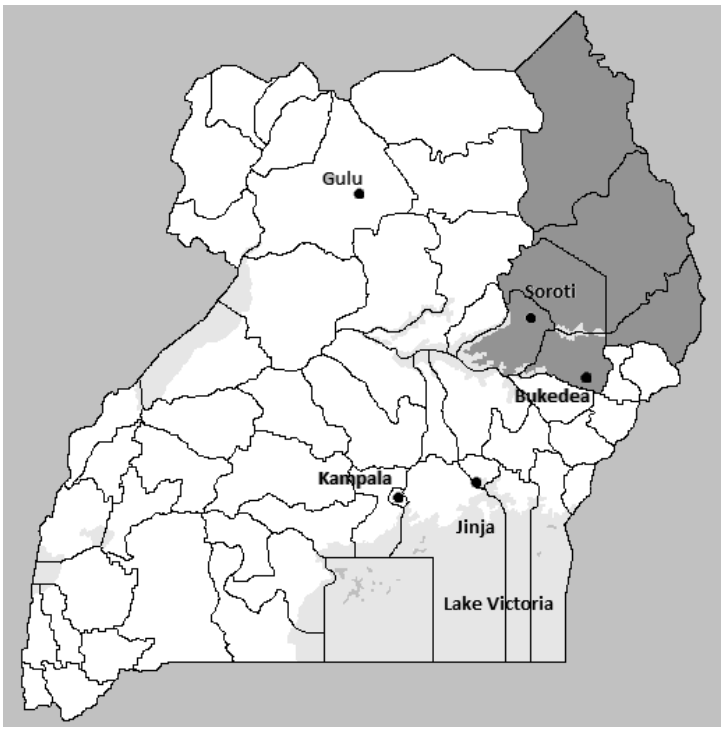

Figure 1.3: Teso and Karamoja. Karamoja includes the three districts to the east of Teso, bordering Kenya.

In the 1980s Karamoja experienced a substantial drought affecting much of the Karimojong's cattle herds. Seeking to restore their cattle numbers they began raiding cattle from the Teso region. The Karimojong move fast, usually running with the cattle for long distances, which makes chasing them difficult. Another problem is that the Karimojong had amassed arms. They were no longer just carrying traditional spears and bows, but they came with AK 47s. They pushed all the way through Teso, reaching as far as Ngora with some of their raids, often burning homes as they moved through. This pattern continued for around 10 years (Mirzeler & Young, 2000).

In 1987 Yoweri Museveni took control of the government, now leading the National Resistance Movement (NRM), and sent troops to help protect the Iteso people and cattle. The troops presence did little to stem the attacks leading people to question their role in the region. Many believe that the troops actually assisted in

the raiding of the cattle, or once they recovered the cattle they sold them for profits instead of returning them to their original owners (Mirzeler & Young, 2000). The lack of action by the government coupled with displeasure over Museveni's rise to power resulted in a local uprising, referred to as the "insurgency" in Teso. This short rebellion was quickly and severely halted by the new government.

By the late 1990's the raids subsided through a confluence of factors, the greatest being the cattle were gone. The Iteso people were forced to change from pastoralism mixed with cash crop growing to subsistence agriculture in less than a generation (Mirzeler & Young, 2000). Respite was not on the horizon for Teso, as more trouble was brewing in the North.

After the fall of Idi Amin, the subsequent governments ostracized the Acholi people, disenchanting many and leading to a new rebel threat. Alice Auma, later Alice Lakwena after claiming to be possessed by a deceased Italian solider, collected people from the Acholi tribe and former members of the army of Tito Okello, the general deposed by Musevini. She led her army on a suicide run towards Kampala. Rather than assume a real army strategy they simply marched through the land, razing buildings, disturbing villages and attacking the government army. They didn't try holding any territory, they simply kept moving on towards the capital. They overwhelmed the government troops with mad charges, but suffered heavy casualties while the government just retreated. Eventually the government worked the army into a trap near the forest between Kampala and Jinja and killed them all. The rebel leader Lakwena figured out the fate beforehand and slipped away to Kenya, leaving her army to be annihilated (Briggs, 2008).

The significance in relation to Teso was great. Teso was the first region after the north the army swept through in their march to Kampala. Once again, homes were burnt and battles took place throughout the region. The second factor is that this rebel was part of the inspiration for Joseph Kony, leader of the Lord's Resistance Army (LRA), who has led a long a devastating insurgency through the north of Uganda. This insurgency reached its peak around 2002 when even schools

around Soroti, in the north of Teso, were raided and students were kidnapped to become concubines or child soldiers. This long-lasting insurgency also took international focus away from Teso and brought attention to the Acholi region. Many people have heard of the plight of the Acholi, because of various organizations like "Invisible Children" and "Kony 2012," or at least of Joseph Kony, after commitments by the United States to assist in the hunt for him and his army. Where the north is looked at as a large post-conflict zone, the east is virtually ignored by post-conflict support efforts due in part to the challenge Teso posed to the NRM. International aid efforts focused their energy rebuilding schools, improving infrastructure and providing other donations and relief where the government pointed them.

Upon my arrival for service in the region was experiencing one of its longest periods of stability. There were still plenty of reminders of the troubles. The school's grounds had been part of a refugee area and still had graves in the center of the schoolyard of those who were killed or died at the camp. The teachers, many only a couple years older than myself, shared stories of hiding in the swamps when the Karimojong came. Other teachers talked about the houses that were burned by the LRA. And most of all people talk about the way things had been before their world had been turned upside down.

2.2 Education System in Uganda

Christian missionaries introduced formal education in Uganda in the 1800s, reaching the Teso region in the early 1900s. Because of the early attachment to missionaries, schools in Uganda are allowed to have a religious affiliation and still be supported by the government. Their reasons for gaining government sponsorship are to lighten the financial burden of the school and attract teachers who are paid by the government rather than locally paid. Private schools do exist in Uganda, but occupy the two ends of the spectrum with regards to quality. Some private schools

begin because of a need due to overpopulation or insufficient government support, while high quality academies focused on preparation for University also exist.

Education in Uganda mirrors that of the British school system. The school year is split into three terms each lasting 13 weeks with a month break between. After the third term teachers assist in grading the national exams and the school holiday is from the middle of December until the beginning of February, the start of the new school year. They have two general levels, Primary and Secondary. Primary consists of grades 1 through 7 with a national exam after P7, which determines the quality of secondary school students can attend.

Secondary is broken into two parts, Ordinary and Advanced levels. Ordinary consists of four grades S1 through S4 with another national exam at the end of S4. Students performing well on the examination qualify for Advance level, S5 and S6, which are focused on three subjects and is the track for attending University. Students who do not perform well are left with the option of attending trade schools, become a primary school teacher, or ending their education. After S6 there is one more national exam to determine their tertiary education options. If they score well they can qualify for free University while others can go on private sponsorship. Of those who can't afford private sponsorship or scored a little lower there are higher trade schools, like for nursing, or the option to become a secondary school teacher.

Both primary teacher colleges and secondary teacher colleges are two-year institutes. After completion they have the lowest degree in their respective fields. Many teachers eventually take additional courses through a University to upgrade their degree to one equivalent to a University degree, which results in a pay raise and other opportunities.

Most secondary schools offer 10 core subjects; Math, English, History, Geography, Agriculture, Physics, Chemistry, Biology, Religious Studies and Commerce. Depending on the size and wealth of the school additional subjects can be offered, including computers, foreign languages, music or arts. On the national

exam students are required to sit for eight mandatory papers, which are: English, Geography, History, Physics, Math, Biology, Chemistry and Religious Studies. Students may sit for two additional papers of their choice giving them a maximum of 10.

Of the 10 tests taken, the best 8 scores are totaled to give the student their result. Raw scores aren't used, instead each paper is standardized and students put into numeric ranks 1 being the best, 8 being the lowest pass and 9 being a failure. The numbers are summed, lowest and best possible score was an 8 (qualifying as a 1 in eight subjects). In Advanced level the process is simplified as students study only three subjects determined by their best scoring combination from O level, either science subjects or arts subjects, and a paper on general knowledge. Their scores are inverted however, with a 25 being the best possible score.

Uganda schools operate with two types of teachers: government appointed and locally recruited. Government appointed teachers have completed a teacher training college or university course in education and are hired by the government. When the teacher is hired he or she are included on the government payroll and assigned a school. These assignments can be anywhere in the country, but their home region is taken into consideration. The school is not responsible for paying the teacher, but does assist in housing. Teachers typically spend the entire term at the school, including weekends, unless there is a significant break for holidays or an election.

Locally recruited teachers are hired to fill openings in the school when they are understaffed. Locally recruited teachers are of two types: trained teachers who have not been officially hired by the government, and government appointed teachers who moonlight at a second school nearby their government appointed school, locally referred to as 'part timing'. Schools enjoy both types of teachers. Teachers who are yet to be hired by the government are a low cost option and rank low on the hierarchy allowing them to be assigned grade levels and topics that senior teachers don't prefer. Part time teachers are appreciated because they offer a

quality alternative to a non-hired teacher. They are better at spot filling for short term and can be used to bolster a thin staff. Many teachers will work at schools in a larger town and part time at rural schools.

2.3 Educational Efforts in Uganda

The government of Uganda put forth two major initiatives to make education more accessible to all children in Uganda. First the government instituted Universal Primary Education (UPE) in 1997, then after the first wave of students completed P7, Universal Secondary Education (USE) was added in 2007. These programs offer free tuition for students who maintain constant enrollment in school. This action allowed groups of previously disadvantaged children to attend school. On the other hand, efforts to help schools with the increase in school populations and higher demands have fallen short. Most schools are left with too few classrooms and teachers to ideally handle the student population.

In addition to improving access to education area the Ministry of Education and Sports is emphasizing changes to instructional techniques. Internal surveys of schools put dictation and lecture much higher than they prefer, especially in science subjects. The ministry instituted a holiday workshop for science teachers called SESSEMAT, or Secondary School Science and Mathematic Training. The goal is to improve science and mathematics instruction and promote the use of technology. Another program running in Uganda is USEP, Ugandan Science Education Program. USEP was founded by a Catholic NGO in Uganda and also promoted technology use in improving science education. St. Theresa S.S. Okunguro was one of the schools participating in this program.

2.4 St. Theresa S.S. Okunguro

I now think time should be given to the school I worked at for two years, St. Theresa Secondary School Okunguro. The school is in the southern part of the region of Teso. It is a rural school in the village of Okunguro, which sits 3

kilometers outside of the town of Bukedea. In Okunguro there is the secondary school, two primary schools, a Primary Teacher College, Catholic Church, convent, catechist training center and a health dispensary. Staff quarters for each of these institutions are also in the area. Fields and homesteads of subsistence farmers surround the area. The Catholic Church founded the institutions in the 1930s.

St. Theresa Secondary School Okunguro has roughly 30 teachers; around twenty are government appointed teachers. Each government appointee earns a monthly salary paid by the Ministry of Education starting at approximately $150 a month. The other ten teachers are locally recruited or part time teachers. They are paid entirely by the school and their salary is approximately $25 to $50 a month depending on experience and number of lessons taught.

The science department had 8 teachers to teach chemistry, biology, physics and mathematics to all grades. In my time there were former students working to help cover classes, mostly in S1. They had performed well and finished A level and were working during the transition from year round school to a University schedule, similar to that in the U.S.

Through teacher observations, interviews and experience most teaching is done through dictation. There are a number of textbooks that follow the curriculum of Uganda, which teachers use to set their notes and dictate to the class. It is also common for a teacher to keep the notebook of a high performing student and use that to regurgitate information back to future classes. Once they have set a good notebook or pick a text they want to read from, the only novel material they will create are questions for review or homework. These questions are more likely in physics and math, while less likely in chemistry and biology unless the unit lends itself to it, something like molarity, reaction rates or genetics. In general it is teaching to the test in its purest form.

There are practical, or laboratory, components for chemistry, biology and physics that students must prepare for. When I started at St. Theresa the immediate problem was a lack of space. At the worst point the S5 students were in a storage

room for their classes. The school had a 3 classroom lab block, however the rooms were permanently full of regular classes. All practical exercises took place after school or on the weekend. The occupation of the lab block made it difficult to prep and almost impossible to do things during the normal school day. Practicals also presented a challenge because it was common not to introduce them to younger students, resulting in only S4 students practicing lab skills. Again, this was related to the problems of space, but also related to the culture of the school.

Overall I would label the morale of my school as relatively negative, but not consistently negative through my time at the school. When I started, the school was in a low point because of overpopulation in the classrooms, lack of physical space and a group of rather unproductive and unhappy teachers. At the end of they year, however, our S4 students sat for the national exam and performed better than expected. This, paired with the exit of a couple of teachers, led to a morale boost in the school.

The first full year I was at the school morale was increased by the beginning of a large building expansion project that doubled the size of our school. The school as a whole felt like it was up and coming providing a great start to the year. One lingering issue was the feeling of under appreciation felt by the teachers. There were always great debates about money uses and issues in my school. Many teachers refused to do any additional work out of normal classroom hours unless it was subsidized by the school. At one point some teachers took this to the extreme. They would skip normal lessons during the day and only taught in the remedial time for extra pay.

This constant back and forth between the teachers and the administration meant that stable, long-term projects were rarely successful. The two sides agreed what would be the focus for the term, argue over money, set a plan then reboot at the beginning of next term. The large building project was funded by World Bank and guided by a pretty strict outline with constant checking making it less dependent on my school and more dependant on the contractors.

Before I was assigned to the school some science teachers were already attending workshops over the holiday periods, SESEMAT (Sec. School Sci. and Math Training) and USEP (UG Sci. Ed Program). These workshops had two emphases: promote different teaching styles besides lecture or dictation and increase the amount of technology use in the school. After two terms I decided that I would try to work off of these programs and extend workshops into the school year and to a greater number of teachers.

The school owned 11 computers, however at the peak only 7 worked. Most were old desktops, which had been used in offices until outdated and had been donated to my school through a local priest. When I arrived, all but two of the computers were boxed up, due to the shortage of space in the school. After two terms we finished a new dormitory that allowed for some reshuffling and I was able to install 5 computers in the staff room. My efforts were also helped when one of the programs leading a workshop, USEP, donated a laptop and projector to the school. The laptop and projector were my major tools in leading workshops for the teachers.

While the school didn't have a lot of educational materials for the computers, they had slowly been collecting CDs and other programs from their workshops. I was able to supplement games, programs and educational software through resources gathered at the Peace Corps office. Volunteers routinely swap and share resources they have found with others who are in need.

Two sets of PowerPoints became invaluable; Boardworx and Barefoot Sciences. These PowerPoints were written to cover chemistry, biology and physics with over 50% of the lessons matching the Ugandan national curriculum. These also with a couple other programs, including PHeT simulations and some e-books became the go to resources for teaching using the computer.

2.5 Role of the Volunteer

A volunteer's initial task when entering a community is to learn as much as possible and begin identifying community needs. The identified needs can be grouped into three categories. The first are needs which the community wants and puts forward unsolicited. These items are similar to gifts and relates to their traditional view of a Western volunteer, someone who comes for a short time and donates a lot of money or resources; typically specific items are requested. This is a common occurrence when Western representatives of NGOs or aid organizations visit sites associated with their organizations.

The second type of need is one that a volunteer can't address. There are limitations to what Peace Corps will support. For example building projects have been removed from Peace Corps grant consideration, and the Ugandan Government prefers to have oversight when building classrooms at schools. The second project was the creating of a dormitory to assist in generating additional funds. The PTA initiated this project with some autonomy from the school.

The third group of needs is problems, projects or operations that can be addressed by a volunteer. These are rarely the first things a volunteer will be exposed to at an organization. While organizations have little problem articulating a lack of computers, books, or other material resources, they don't want to promote their inefficiencies or operational issues. These needs take time to identify, understand, and approach.

CHAPTER 3- LITERATURE REVIEW

Information and Communication Technologies (ICT) have had a quiet beginning in education, but have become an essential component in preparing today's students for roles in the future workplace (Buabeng-Andoh, 2012). Initial excitement over the prospect of acquiring computers and other new technologies in the classroom led to significant spending in the education sector in the 1980's and 1990's. Early opponents like Larry Cuban made predictions about computer use in schools, proposing that for all of the hype and expense dedicated to computers, they were difficult to operate and master, slow, prone to breaking, and generally incompatible with the requirements of teaching (Becker & Ravitz, 2001).

These predictions of the 1980s and 90s may look silly today with the integration of ICT resources into everyday life, but through the 1980's and 90's Cuban's statements held up in many respects. Large computer labs in schools were and are infrequently used. Teachers who prefer teacher-centered activities refrain from using computers in the classroom and computers aren't a great fit for every subject. Conversely, there now is more computing power in some watches than in 1980s computers, and software has been adapted for the classroom which allows for exploration learning (Becker & Ravitz, 2001); the internet has become an essential tool for communication and transmission of knowledge; and interactive technologies like projectors, Smart Boards and document cameras have been developed specifically for use in the classroom.

Another argument was that technology adoption wouldn't occur because of a lack of teacher comfort and knowledge of computers and software. Again this argument was once accurate, but as computers have become more integrated with everyday life and teachers are trained earlier in the uses of technology in their field, the issue has diminished. Even after heavy investment and high expectations, not every dream has been realized, and most came after a considerable lag time of introduction of resources and training (Becker & Ravitz, 2001).

Cuban's predictions shouldn't be dismissed, just because his predictions didn't were surpassed through the expansion of computers into components of everyday life. We can also use his predictions to assess areas where they are being used in the classroom and appreciate progress that has been made. When teachers have adequate technical expertise, adequate classroom access and a teaching philosophy supportive of their use, computers are a great fit in the classroom. Teachers who are professionally active, providing leadership with their teaching peers, are the most active computer users of all (Becker & Ravitz, 2001).

Cuban's skepticism and the subsequent successes over the issues he raised can offer a useful perspective into how ICT adoption in Uganda can occur. Adoption and usage of ICT by developing countries has followed a pattern similar to that of developed countries (Ssewanyana & Busler, 2007). In 1980s America computers were limited in their abilities and had little learning-specific material. Teachers of Uganda today understand the potential of computers better now that programs and lessons have already been developed for schools. There is less of an unknown quality about computers as there was in 1980s America. Conversely there are very few personal computers in Ugandan homes, whereas a home computer were more frequent in 1980s America.

Adoption by the private sector happens quicker than in the public sector, creating a significant delay in personnel to fill positions in the workforce. Government and Non Government Organizations (NGOs) have invested heavily in ICT in the education sector only for adoption to lag behind the private sector and its needs of a computer literate workforce (Blaak, Openjuru, & Zeelen, 2013; Buabeng-Andoh, 2012). ICT is considered a key factor behind sustainable development (Bon, 2007), creating even more pressure for resources, trained professionals, and adoption in schools. Evaluating the issues in the slow adoption of ICT in schools can be explored through the critiques raised by Cuban.

The pressure of ICT integration falls on three components of the education system: the governmental Ministries overseeing education and technology, the

schools and their administration, and the teachers who will be integrating ICT. Recently, the outlook for schools has changed, as a joint initiative by the Ministry of Education and Sports (MOES) and the Uganda Communication Commission (UCC) has started providing computer labs for secondary and tertiary institutions. This has been coupled with the inclusion of Computer Studies as a required paper for the Advanced Level leaving exams (UACE). These steps come as the country recognizes just how important ICT is in daily lives. The effect of ICT on the workplace and everyday life requires some organization to be responsible for bridging the technology gap (Buabeng-Andoh, 2012), a role schools are best able to handle. New computers are distributed throughout the country to both urban and rural schools. These efforts relieve some of the pressure on NGOs supporting schools. While NGOs are helpful and offer a good base, they need long term external funding to sustain their initiatives (Loving, 2007).

Structural challenges of Uganda's 'top down' education system leave Head Teachers with a balancing act and can create barriers to ICT adoption. Most decisions about staffing, funding and curriculum are dictated by the Ministry of Education and Sports, leaving Head Teachers with the task of running day to day operations of the school, ensuring curriculum requirements are met, and reporting school conditions back to the Ministry. Staffing and funding are contentious issues especially in the days of USE (Uni. Sec. Ed.). Schools are routinely understaffed, resulting in class sizes higher than 60 students, more than the Ministry intends (Blaak et al., 2013). In a decentralization effort, financial decisions have been given to the Head Teacher, in conjunction with the Board of Governors of the school. However, school funds are commonly earmarked for specific purposes, making decisions by the Head Teacher about satisfying both the schools needs and the ideas of the government on limited resources (Agatre Okuonzi, 2004). While the government pays the school tuition fees for each student, those funds arrive only once a year, usually halfway through the second term. It is common practice for schools to charge additional fees to supplement government funds in running school

operations (Blaak et al., 2013). Adding computers poses additional financial strains for the administration as funds will need to be assigned for upkeep, electricity, and other incidentals.

Teachers in Uganda have little ICT training, either in general computer skills or knowledge of how to use computers pedagogically. Programs for teachers to learn these skills have been unsuccessful for a variety of reasons. Key factors hindering teachers from attending computer workshops or practicing skills learned include being overworked and overcommitted at their school (Buabeng-Andoh, 2012). A challenge for those organizing workshops is teachers misrepresenting their level of computer literacy. Some teachers selected to attend workshops slow down the covering of content and divert the content to basic or remedial information to facilitate the undertrained. This limits the amount of new information proficient teachers can gain (Burniske, 2003; McKagan, 2010). While fear of failure and uncertainty about the material they would present are the most significant hurdles for teachers, teachers positive attitude and perception play a larger role in teacher adoption than do computer competency or perceived usefulness (Buabeng-Andoh, 2012). A more discriminating view would include the observation that a lower level of professionalism and motivation among Ugandan teachers lead to less participation in professional development (Wallace, 2003).

The quality and capability of computers available in Uganda also limits their use in schools. Many computers are slow and difficult to use because most are donated used computers from the United States or Great Brittan (Wells & Wells, 2007). Computers fail for a number of reasons: age, misuse, software problems, viruses, and more harsh and dusty conditions than computers would normally see in office or home use. Computers experience unplanned unavailability, potentially for weeks, due to regular issues with power generation and infrastructure. This leads to teachers being reluctant to rely on them for frequent use.

A recent survey in central Uganda found that when computers were first given to schools they were used primarily by school administrators (Head Teacher,

Director of Studies, Bursar) for the management related tasks. Next, computers would be set up in the staff lounge for teachers to use. Finally computers would be designated for student use. There was no consistent threshold at which computers would become available for students. Some schools had 5 computers, with 2 for students while another had 11 computers, with 3 for student use. In many schools no computers were available to students (Newby, Hite, Hite, & Mugimu, 2012). The survey also found the number of working computers was almost equal to the number of broken machines present, highlighting the challenge schools face in getting quality ICT resources. Most schools relied on donated computers, while only a couple bought a number of their computers and one received computers from the government (Newby et al., 2012).

The survey also shows the pattern of teacher adoption of computers. Eighty-five percent of the users used the computers for some type of administrative work, followed by 45% using them for personal entertainment and 45% using them for pedagogical needs. When select teachers were interviewed most indicated that their colleagues used the computer for entertainment as well, but underreported that in the questionnaire. Those responding as using computers for pedagogical use included tasks like producing hand outs or assessments as well as actual lessons for student participation, making the 45% a more reasonable number (Newby et al., 2012).

A common complaint from teachers is a lack of resources and funding for any non-lecture based activity (Johnson-Pynn & Johnson, 2005). This decision by the administrations affects using computers in lessons, but could also indicate a lack of comfort with current resources and the connections between resource content and the curriculum. The introduction of computer simulations like PhET by the University of Colorado (McKagan, 2010) and PowerPoint presentations by companies like Barefoot Education show that curriculum relevant software is available in country and is either freeware or easily accessible through a network of users. Typically an ICT workshop would provide attendees with some computer-

based material that could be used at their schools. The simplest range from picture CDs of plants and animals to videos of experiments and simulations like the PhET software.

Simulations and videos of experiments are extremely valuable and can be used in a teacher centered lesson that does not require a full computer lab (Becker & Ravitz, 2001). Simulations are probably the most valuable software as they can run repeatedly without the expense of costly materials or chemicals otherwise required. Simulations can often be varied in speed so learners can pick up the key concepts and information without being left behind and can be used as a scaffold by providing conceptual change for students before they encounter it in lecture (Akpan, 2002). Simulations promote learning about what ifs and possibilities (Becker & Ravitz, 2001) similar to the science concepts promoted in interactive lessons or lab work.

Videos are equally important because many are created by Ugandan teachers specifically about curriculum content. The demonstrations video tapes showed experiments not typically performed by teachers, yet the set-up, steps, and concepts are all required knowledge for the UNEB exam. Since internet isn't common in schools (Bon, 2007) the resource system is more dependent on this locally produced and distributed material. While educational software has come a long way most is produced for Western education systems. Uganda follows the British system in general structure but they have their own wrinkles and changes in content and curriculum expectations.

3.1 Research Questions

Existing literature and personal experience indicate that many Ugandan schools lack a framework for receiving computers and utilizing them for student learning. This is emphasized by the information highlighting the lag in ICT adoption for Uganda and the future role it will play in development (Bon, 2007). Uganda needs workers trained in ICT and the schools need to embrace computing

and ICT skills as a necessary component of an education that prepares students for the real world (Newby et al., 2012).

Two questions this report will address are:

1. How can computers avoid the fate of underutilization?
2. How can computers become and remain a sustainable component in schools?

The first question will require an examination of the fundamental framework schools need to establish to accept computers from any source. Computer adoption and use can be evaluated as a function of the balance between administration, teachers and students. Each group represents a set of stakeholders who have their own desires and needs which, if not met, will prevent the framework from being adopted. The second question addresses how actions by stakeholders can promote ICT integration and adoption, and checking these actions through teacher responses and input from the community.

Cultural differences cannot be overstated in this process. Many of the ideas that appeal to Western culture do not sync with Ugandans perspectives and accommodations must be considered in working out goals and meeting expectations. While it can be hoped that this report can be useful to organizations or ministries in Uganda, the main audience will most likely be volunteers and NGO workers, especially international workers who will need to understand the complexity of working with multiple stakeholders having diverse expectations in a school setting. Navigating the cultural needs of a project and the areas misrepresentation take place will also be considered in this report.

CHAPTER 4- METHODS

4.1 Study Parameters

Three schools were selected to participate in the study and were chosen to fit several specific parameters. Each school was government sponsored and located near a town. Each school had computers and ICT resources related to science, not an original condition for selection, but important for later discussion. The other connecting thread was each school had a Peace Corps volunteer in their school. There were some differences among the three schools, but weren't considered detrimental. The school sizes were spread, one small, one average and one large. The small school had 330 students, the second had 800 students and the third had 1300 students, approximately. Two of the three had boarding students, but in both cases only girl students were boarders. In each school, boys were day scholars.

The presence of a Peace Corps volunteer in their school was important for a number of reasons. Each school would have been exposed to Western perspectives and initiatives, as well as become familiar with our communication style. The process of obtaining permission to visit the school and interviewing staff was also smoothed by the volunteer presence. Some questions asked in the survey could be interpreted as an evaluation of teaching, which wasn't the purpose, and knowing the role of a volunteer along with the IRB statement allowed teachers to answer more truthfully instead of fearing the exercise as an evaluation for the Ministry. Lastly, a volunteer could assist as a proxy because visits to each school were limited due to time constraints and travel issues.

Science teachers were the target group of the study and were surveyed at each school. These teachers were chosen initially to compare curriculum coverage, but the same group was maintained for the follow up survey because similar resources were present at each school. Two surveys were written, one for teachers and one for the head of the science department, to collect information about the department and school. The initial teacher survey asked questions about curriculum

coverage, and was used to collect demographic data about the staff. The initial head of department survey provided demographics of the schools and school dynamic.

The follow up questionnaires were given to both teachers and the heads of the science department. Surveys again asked about curriculum coverage, and included questions about teachers' relationships with ICT. Teachers were asked about their comfort with computers and the programs or ICT resources related to their disciplines. Teachers were asked to rank barriers they had in adopting or integrating ICT into their science lessons. Open-ended questions collected information about their use of ICT in the classroom or specific reasons for non-use.

Both the pre and post surveys were administered at the schools and given to the teachers in written form. The teachers present then filled out the surveys while I visited the school. Attempts were made to leave surveys for absent teachers to fill out later, but none were collected. The surveys were in English. Two schools were located in Teso, but the third school was in the Bugweri region. English is the unifying language of the country and all secondary school instruction is in English. Differences in word usage between American and British dialects weren't reported as an issue. The surveys took approximately half an hour to complete.

The pre and post surveys each had 12 respondents among the three schools. In the first survey each respondent answered all questions. In the second survey teachers were asked to rank various barriers to using ICT in their classroom. Six potential barriers were provided for teachers with an "other" category to add their own. Most barriers on the survey were identified through observations and conversations with teachers, but their relative importance in preventing adoption was not apparent from discussions. Twelve surveys were returned and are discussed below. Five teachers ranked the statements while the seven others skipped this section, only completing the open responses.

Questions asked of teachers break down into three components: skill development, information or techniques covered in workshops or teacher development over holidays, and use or perceived role of ICT in the school. Skill

development ranged from how to turn on a computer to very specific tasks in programs like Microsoft Word to installing programs. Questions about professional development were used to align work in the school with the objectives and goals of MOES. Finally, questions were asked to identify uses and ideas teachers wanted to implement.

In addition to surveys, frequent discussions were held with teachers regarding their comfort with and interests in ICT resources. Participatory observation was used to understand teachers' perspectives at my school. In order to organize lessons and workshops, information was collected from the teachers. The information was used to ensure lessons remained relevant to teachers' desires in regards to developing resources for classes, integration with the curriculum and ICT skills. Many of the activities were related to the professional development workshops teachers attended during holidays. The lessons and workshops included ICT resources collected while participating in those workshops and resources shared by volunteers in country.

Other Peace Corps volunteers in Uganda provided additional information. Volunteers commonly network with one another to share best practices and positive results with fellow volunteers. Almost every volunteer finds himself or herself assisting in computer work at their school or organization. To prevent other volunteers from 'reinventing the wheel' resource banks are also available at the Peace Corps office in Kampala. Resources include operating systems, antivirus software, programs and tutorials. Communications between volunteers such as newsletters and personal correspondence were also used.

CHAPTER 5- TEACHER SURVEY

Three schools were included in the study, St. Theresa S.S. Okunguro (school 1), Bukedea Secondary School (school 2) and Budadiri Girls Secondary School (school 3). Both pre and post surveys were given to teachers at each school and the heads of science department. Demographic information was collected for each school through a survey given to each head of department (Table 5.1).

Table 5.1: Demographic information on the three schools surveyed.

School	Students	Science Teachers	Remedial Lessons
1	809	10	Yes
2	1300	10	Yes
3	330	5	Yes

[1]Table data was collected from surveys given to heads of department

Only school 3 had all teachers present to take the initial survey. Otherwise at schools one and two fewer than half of the teachers submitted their survey. Administering the surveys when all teachers were present was challenging as many have second jobs including part time positions at other schools, are involved in agricultural activities to supplement their families, or live far from the school and visit home when not teaching. Leaving surveys to be filled out later proved to be unsuccessful.

Information about the amount of computers in each school, how many were broken, the breakdown of their uses, the presence of a projector and the presence of ICT resources for science lessons was collected during my visits to each school in talks with teachers or the volunteer there (Table 5.2). While the amount of computers varied widely per school, each had the potential to use ICT as a resource for conducting lessons, either in a lab of using a projector.

Table 5.2: Pre Survey information and resource identification

School	1	2	3
Responses	3	4	5
Identified ICT as a resource	1	1	1
Instruct Remedials	3Y	3Y / 1N	3Y / 1N
Subjects taught by respondents	Chemistry, Biology	Chemistry, Biology, Physics	Chemistry, Biology, Physics
Computers at School (broken)	12 (4)	30 (2)	16 (2)
Computers for Administration	2	3	2
Computers for Teachers Exclusively	1	3	0
Computers for Students	5	24	14
Projector	Yes	Yes	No
ICT Resources for Science Lessons	Yes	Yes	Yes

Table data collected from surveys given to science teachers and interviews at each school.

In the pre survey a teacher from each school identified a component of ICT as a factor or resource that could improve syllabus coverage. This is significant because the initial survey didn't reference using ICT or ask about prevalence in the classroom, yet teachers identified it as a potential tool or resource for improving lessons. The respondents did not identify specific ICT resources, meaning uses like printing handouts or administrative style tasks could have been considered.

Each school had a comparable set of resources, which allowed me to consider the post surveys as a single group. Each school had ICT components for student use, the larger two schools possessed a projector allowing large classes to be covered and the smaller school had a ratio of approximately 4 students to a computer. The schools also possessed ICT resources for ICT lessons: programs, videos or lessons for use on computers.

Barriers to ICT integration by teachers were averaged and given a ranking for all responses. While one teacher ranked his or her response for "other", no other teacher included a ranking and it was excluded from the average. From the averages, unfamiliarity with ICT resources and unfamiliarity with how to use the technology were the greatest barriers identified, respectively. Does not match curriculum and not wanting to use ICT were the lowest barriers (Table 5.3).

Table 5.3: Rankings of Barriers to ICT integration

	Teacher Ranking						
Statement	#1	#2	#3	#4	#5	Ave.	Rank
A) Unfamiliar with ICT Resources	1	2	5	2	1	2	1
B) Unfamiliar with how to use the technology	2	1	6	1	3	2.6	2
C) Unsure of how it matches with the curriculum	4	3	7	3	2	3.8	4
D) Do not have time for ICT integration	3	4	2	4	4	3.4	3
E) Does not match curriculum you teach	5	5	3	6	6	4.8	5
F) Do not want to use ICT in your lessons	6	6	4	5	5	5.4	6
Other	N/R	N/R	1	None	None	-	

Table data collected from the second teacher survey.

The statements added to the barriers reflected those given in the open response and included statements about limited resources, large number of students per class and the lack of classroom space. Each is a typical response to questions about issues limiting teachers. The response is challenging to classify because it is a valid issue to raise, but little effort is put forth to work within these constraints that are ever present. This study focuses on working within current parameters and not solving long-standing issues.

Ignoring the 'Other' responses, of the six provided options, unfamiliarity of resources and how to use the technology were clearly the top two barriers. This is understandable since most teachers at each school didn't have training on computers until after their teacher training, either in professional development or in further studies at University. This disparity was observable in workshops at my own school. Age was the biggest hurdle in teacher skill levels. Younger teachers with a higher degree and who had attended holiday workshops were highly skilled. Older teachers, even with higher degrees, were educated and upgraded their degrees before computer instruction was available. During lessons or workshops at my school the older teachers focused on basic skill development--using a mouse; typing; and learning programs. Younger teachers were familiar with many programs and explored their possibilities.

Two other important barriers were lack of time for ICT integration and uncertainty about how it coordinates with the curriculum. Scaffolding these practices was the most challenging part of the workshops. Teachers would learn a program and play with it enough to see its potential, yet not place it in context of their curriculum. Exercises on the computer remained separate, like a laboratory example. This challenge was also noted in workshops introducing PhET simulations (McKagan, 2010). ICT was seen as a supplementary component or enhancement rather than a feature a lesson could be built around. Two different ideas can be identified. First is the challenge of getting teachers away from a lecture that is based class based on reading from notes or a book. Second is the acceptance of cross-curricular connections.

Before 2010, the Ministry of Education and Sports began efforts for teachers to diversify their lessons. At a school visit, a Ministry representative referred to a poll that reported over 80% of lessons in Uganda were taught by dictation from a book or set of notes. Science subjects were dictated a little less because of laboratory, but student engagement was poor. Observations of lessons coincided with the ministry poll, even though each term break teachers were being trained and

encouraged to incorporate more methods of instruction. Two of these programs SESEMAT and USEP specifically target science and ICT incorporation.

The lack of cross-curricular connections is another area of concern. Computers at school are predominately viewed as materials for computer lessons, resources for one subject are exclusive to the subject. Teacher experience in connecting ideas and concepts between subjects is limited because of the curriculum expectations. For example biology and agriculture include many areas for potential connections, biology is theory where agriculture is applied. Instead the curriculum uses different vocabulary, different ways of expressing content and separates ideas keeping them independent from each other. Making the step of using outside resources is counter to their prior thinking.

It is understandable that statements E and F were ranked as the lowest barriers to ICT adoption. Government initiatives, including SESEMAT, have encouraged the use of ICT. Wanting is the first step in adoption and all of the energy the Ministry of Education and Sports has spent to demonstrate the potential for ICT use has started the process of integration. Additionally, each teacher was aware their school possessed ICT resources for science lessons. Teachers included qualifiers about the resources, saying they were limited or the school didn't have internet. Considering statements C and E together suggests that teachers understand that information in their resources connect to the curriculum, but haven't been able to understand the resources well enough to integrate them into lessons. This can also imply the "limited" resources may have more potential application than teachers currently know.

Four teachers responded as to using ICT to assist teaching, with one adding an ICT teacher assisted them in implementation. Each used the ICT in a normal classroom period; none were done in remedial lessons. Two teachers used a projector to display visual aides unavailable through conventional means, one demonstration lesson on machines and another teaching cell division and reproduction. The implied frequency of use was low as each respondent gave only a

single example. It is interesting each lesson using ICT was taught during normal classroom periods and not a single one was taught in a remedial. During those times they would, be able to use any classroom they prefer, not have to compete for resources and not have to rely on the resources for an entire lesson.

Teachers who didn't use ICT in their lessons cited time, access to resources, having a large number of students, and a lack of electricity. Teachers who cited issues of classroom space, number of students and competition of resources could use remedial lessons to circumvent those problems. The lack of complete understanding of ICT resources was also repeated from the ranking barriers to ICT use. Specifically the lack of an ICT teacher made teachers hesitant to implement ICT into their lessons. This suggests the ability to co-teach may improve ICT adoption once an ICT teacher is appointed to the school.

5.1 Volunteer Perspective

Many volunteers make the mistake of separating computer use between job appropriate and leisure activities or entertainment. Where computers are common it is known what a work computer should be used for and to use personal computers to access videos, games, music, watch movies, visit sites like Facebook and entertainment. Most Ugandan teachers don't have personal computers and therefore value school computers for personal use. Patterns of adoption in developing countries follow those in developed countries

A positive perception of computers is the biggest step in adoption (Buabeng-Andoh, 2012). Making room for activities for teacher to satisfy their needs of Internet use, movie watching, game playing or listening to music can alter their attitude towards computers. That isn't to say the work should end there. After creating a positive attitude, ideas of usefulness can be integrated, starting with satisfying individual needs. A teacher may be attracted to writing student assessments using a word processor so they can be saved and reused, while another may see value in simulations and videos. Personalized lessons focusing on

programs or curriculum connections may expand teachers' ideas or knowledge. Encouraging this step builds on the positive perception teachers have allowing gradual introductions of new ideas.

Remedials offer an ideal time to try implementing ICT materials. The term "remedial" may be misapplied, as remedial lessons usually cover new material, just in a supplementary time slot. Using remedials for ICT integration would benefit from there being no other classes competing for time or classroom space. Lessons could be done using a projector or the class could be split into sections to use laboratory computers. The instructing teacher could cooperate with the ICT instructor to assist in the lesson, lessening the pressure to perform tasks they aren't confident about. A remedial lesson also wouldn't detract from normal progress in the curriculum if a lesson didn't completely connect to the curriculum.

Addressing the barriers teacher identified can only take place once they see a personal benefit and have a forum to explore the possibilities. Teachers struggled to work on skills individually, but succeeded when participating in groups over weekends or during school holidays. Some teachers may appreciate the opportunity to improve their lessons. The expectation that extra work should be rewarded with incentives could require compensation for teachers who work on supplementary activities to adopt ICT. Professional development days are commonly supplemented with money for travel, meals or attendance money, even when held within a home school. The incentives also show teachers the administration is supportive of their actions, and appreciate work done to improve the overall school standing.

Science teachers have been given preference on ICT training and use, however teachers in the arts subjects have equal potential for ICT integration. Encyclopedia software, maps programs, typing tutorials and word processors all are present in Uganda and could be incorporated into lessons in the same way science resources could. These lessons would also have potential to create connections; a history assignment might be used to teach students how to use an encyclopedia

program. It could be used to introduce concepts like using a search bar, menu navigation, and reviewing results. Direct connections between these technique and internet usage could then be made even without internet at the school.

Teachers are not the only component in ICT adoption, but they play the largest role. Administration and the rest of the school community, the students, parents and support staff also have impacts. Administration can promote or discourage adoption through their policy, parents and students may fund or not fund ICT activities and support staff may see technology as assistance or as a threat to their job. Teachers have the greatest day-to-day interaction and exposure to computers. The pattern of computer introduction also demonstrates the importance of teachers. Computers arrive before an ICT teacher, meaning unqualified teachers are asked to fill the position. Even after an ICT teacher is hired, the class doesn't immediately enter the school's timetable. Advanced level students are required to take computer courses, meaning they will be given priority over students in Ordinary level. Slow adoption by teachers limits the use and exposure of computers to students. Facilitating teachers' positive attitudes, providing them with the training and opportunity to implement and creating an expectation of use can derail that path.

CHAPTER 6- BEST PRACTICES

Teacher adoption is a prominent component of ICT use in schools, but many other factors promote or inhibit the adoption and integration of ICT. Among the most important factors are 1) the interaction among the stakeholders in the school community; 2) long term planning to make computers a sustainable resource in the school and 3) the policies necessary to support and maintain ICT use in the school.

6.1 School Community

Three groups make up the school community; administrators, staff and users. The administrators are the Head Teacher, Deputies, the Director of Studies, Bursar, and the Board of Governors. The staff includes all teachers, secretaries, and support staff. Users are comprised of students and parents represented by the Parent Teacher Association or a forum for parents to provide input and voice concern. When introducing a computer lab or ICT materials into a school each group has responsibility and affects the success of the resource adoption.

Administrators are required to make and enforce policies within the school, as well as regulate finances. When a computer lab is introduced they make decisions about what space will be used, what resources are used to support it, and how funding will be generated and allocated. Many schools use a computer lab fee to generate the income. One issue with a fee is making sure the money is used for the intended purpose. The administration could see an increase in revenue as an opportunity to complete other projects for the school forgetting an allocation for ICT purposes.

While administrators have primary authority of the money in the school, the staff and users have a role in its allocation. Since fees are passed through the PTA before they are charged, users typically insist that the funds be used for their intended purpose. Students can push teachers to use the materials either inside or outside of class and request computer lessons, clubs or activities that use the ICT

materials supported by their parents. The ultimate power of the users is that if they feel they aren't getting their money's worth they can move their student to another school.

The teachers are ultimately most responsible for adoption of ICT in the school. Their adoption can be hindered by decisions made by the administration and the users. The administration is encouraged to facilitate and support the professional development of teachers, which may occur at the school or away at workshops. Once teachers have become more comfortable with the technology they will request programs, videos, components or computers of their own. Their interaction, with students will give them feedback on how much the technology improves their classroom experience and learning. When the students demand more, teachers need to be prepared to use the materials in extra lessons or clubs.

Support staff also has interest in simplifying their work through the use of computers. Handling examinations for every class can be a burden under any circumstance, but typing exams and printing hundreds of copies on a duplicator is especially tedious. Transitioning to new technology improves staff productivity and reduces the school's dependence on antiquated equipment. Teachers will be able to produce their classroom handouts or assessments and provide them to the secretary to print and organize. They will also be able to save and reuse what they create each year, adapting the resources as they see fit.

The three groups in the school community not only work together, but they comprise a system of checks and balances. When the balance shifts too much to one group, the school doesn't perform to expectations. In practice the three groups often end up in a hierarchy of administration, then staff, and finally users. Much of this is related to culture and traditional levels of respect given to positions of authority in Uganda. Teachers are authority figures, and the Head Teacher is in charge of the teachers and school. Gradually, Western influences are adjusting some of the roles in the school. Teachers' interactions with students are loosening from rigid

formality, dictation, and rote learning toward interactive lessons, question of students and conceptual learning.

Each group presents its own unique concern: convincing families who live on very little to spend more on their child's education, encouraging teachers to participate in professional development with no obvious immediate benefit, dissuading administrators from seeing ICT revenue as a means to carry out unrelated projects or spending it all at once. The role of the volunteer is to sell the idea of ownership to each group. With a more detached perspective, a volunteer can try to encourage balance among the groups in the school community. Most volunteers will be affiliated with the teachers and therefore see many things from their perspective, but being a novel component of the school allows for freedom to interact and influence other groups.

Teacher use reinforces the need to use funding for further development. The school can justify buying a printer or copier when all the teachers are using a word processor to write exams. Administrations currently don't accommodate various teaching styles including the use of a projector and laptop for videos, simulations or PowerPoint. Teachers who want to developing their own resources, improving lessons and participating in professional development outside of school time should be compensated.

Adoption by teachers can also influence excitement on the part of users. Students will be the direct beneficiaries of ICT resources. Handouts, lesson supplements, new teaching techniques and more visual approaches could support students. Students are already eager to use computers and are excited by opportunities to participate in a class or club to gain more exposure to ICT. Clubs are a very underutilized idea in Ugandan schools. They are an ideal activity for volunteers because they are simple projects that can attract a very interested, devoted and engaged group of students. Students can participate in a wide range of activities regardless of their prior exposure to computers: learning computer basics, exploring hardware and assembly, or writing simple programs. As they become

more experienced students use can include using computers to make movies, school newspapers or supplement secretary work.

With the advent of USE, more students are achieving an Ordinary level certificate than ever before. Now the ordinary level certificate is becoming devalued in Uganda's struggling economy while advanced level certificates and tertiary degrees are in demand. Having computer skills can become a decisive factor in obtaining limited positions. As computers infiltrate even remote village businesses, computer skills will soon become a basic requirement in job performance. Having the opportunity to become familiar with these skills at O level may be the difference between generating an income and relying on subsistence agriculture.

6.2 Resources

When computers are purchased or given to the school few people understand the full assortment of resources that need to be dedicated to each machine. Currently desktop computers are preferred in Ugandan schools over laptops. The obvious drawbacks are that desktops cannot run when there is no electricity and they require more components to operate. Theft is common and schools see securing laptops as much more difficult compared to desktops. Fixing a desktop CPU is also a less challenging than laptops, as spare parts are more common. At the moment schools ask their computers to do relatively little, and their performance demands can be met by cheaper and older desktops rather than more costly laptops, which when new are substantially higher in price. In 2011 a desktop computer and monitor could be found for 800,000 shillings ($400 US), while a similar laptop would be 1.2 million shillings ($600 US).

Components like mice, keyboards and monitors are important, but basic requirements like tables, chairs and a room dedicated to computers are also needed. Schools with limited space and resources can work around these issues based on how they divide classes or multipurpose a room. Many schools have a laboratory

block that is empty most of the day. These blocks also normally contain more than one room. By working out a proper schedule of use, one room could become a computer lab while the remaining space is used for science lessons. Other schools have a library that could serve two purposes. In one case a school kept computers in a classroom with a temporary divider, then lessons or work by teachers was allowed in the evenings. A little creativity can go a long way.

A recurring problem in my school was that tables or desks were required for special events. Desks would be removed from the computer lab, while the computers would be stacked on the floor. A simple investment in more tables and desks could have solved this issue and eliminated the potential issues from improperly storing the computers. Reclaiming the tables was also an arduous task, as different rooms and groups were in competition for them. Chairs and stools shared a similar nature, which sometimes required students to go and collect their own chair before beginning a lesson.

Keeping power problems from disrupting the computers is a difficult challenge. Computers require an uninterrupted power supply (UPS) to protect them from the irregular current and outages of the Ugandan power grid. A UPS stabilizes current and provides battery power if power is suddenly lost, allowing the user to safely shut down and protecting equipment from power surges limiting the financial impact. Several members struggled to understand the role of the UPS, believing that a computer could be plugged directly into the wall. This is less risky in the capital, Kampala, where many workshops are held, but in village schools the quality of wiring, fuses and other safety checks are less assured. UPS also requires power strips or extensions, allowing for maximum use of outlets and providing another fuse for protection. Power strips were constantly removed from the computer lab and used around the compound, most often for teachers and students to charge their phones. The school showed a general lack of respect for resources in the computer lab. Respect for equipment and the physical space must be instilled in schools.

Solar power has been an initiative in Uganda, with numerous schools given panels, batteries and electricity management systems. This, unfortunately, appears to be an all or nothing technology. Only one school I visited demonstrated a consistent use of their solar resources. Other schools systems had fallen into disuse or disrepair shortly after installation. One school decided to abandon their system because they were connected to the main electricity grid, even though power was absent half the time due to repairs or load shedding. It is normal to work without electricity so the presence of a solar system was seen as a convenience. Changes in solar technology and a greater access to electricity may reverse this trend.

Creating a culture of respecting resources is a multilayered process. It starts with an administration that can assign responsibilities and enforce policies within the school. They also must work to diffuse conflicts over resources, especially in schools that are resource poor. Teachers are willing to accept changes and expectations that go along with ICT adoption. While many teachers learn how to use computers, few learn about computers, their capabilities and requirements. Students don't currently learn to respect the materials, but this is an easier task when the teachers already know correct behaviors.

6.3 Control

A fundamental issue when starting a computer lab is who will have control or responsibility over the lab. Many times volunteers are thrust into the position of either replacing or supporting a teacher whose first training is not in computers. It is common for schools to get computers without a computer teacher. Governmental hiring lags anywhere from 1 to 4 years behind the graduation of teachers, meaning the appointments of newly trained ICT teachers may take longer than anticipated. The interim ICT instructor is usually expected to learn computers, but they can refuse to participate, as they are typically a marginalized staff member already. Neither a volunteer or out of content area teacher has much authority over a computer lab, but the absence of a person with authority is a huge draw back.

Ideally one or two people should be in charge of managing the computer lab. They should be responsible for the computers' welfare, but also for maintaining the status of ICT in the school. It is important for their role to encompass being more than an ICT teacher. Part of their job will be balancing demands from teachers, to use ICT for personal or professional reasons; educating students; and promoting a positive attitude of the department.

The ICT teacher must be able to assess needs and propose reasonable ways forward in development. An example of a poor lab manager can illustrate this point. At a near by school the lab manager rarely taught lessons to the students, priority on personal work over educating. The lab was arranged poorly and not conducive for students to work on the computers. The instructor requested the administration to purchase items like carpet for the lab, new desks, tables, chairs multiple new computers, and an air conditioner, totaling nearly $25000. This lack of perspective made the rest of the school dismissive of the lab and its manager. Poor management led to a poor attitude and disregard of both the department and the potential of ICT.

6.4 Funding and Spending

Since corruption and misuse of funds is common in Uganda skepticism about monetary issues is high. Most activities other than teaching are incentivized. When teachers believe more funds are available they expect a larger amount for the services they provide. Funding a computer lab through lab fees has many positives, but considerations must be made for each of the parties involved.

There are many advantages of funding though a lab fee. Having a lab fee promotes ownership of the computers for the Parent Teachers Association (PTA) and the students. The introduction of USE was meant to eliminate or minimize the fees schools could charge. This has worked to a small extent, but schools are still often underfunded. Most have developed ways to generate funds used for day-to-day operations. Since the government doesn't technically sanction fees, the PTA usually approves what fees are acceptable for the school to charge. Common fees

include uniform, meal, boarding, and the funding remedial lessons, at levels agreed by the PTA.

The administration is left with the role of collecting appropriate funds from the service users and holding the expectation over the teachers of use of the materials provided to them. The later is the most important of all of the relationships in the triangle. The accountability of teachers is a struggle but harmony between the teachers and the administration can be a significant reason in keeping incentive systems.

A long running debate between volunteers is how to get ICT fees to remain funding ICT. Many schools simply lumped the money into the general school account, leaving teachers and volunteers racing to submit purchase requests. A commonly held belief by volunteers was that the ICT fund should be completely separate from the general fund. Trying to convince administrators to hold millions of shillings out of the budget was always a losing proposition. Many ended up frustrated and disillusioned with the possibility of funds ever supporting the lab.

In one school with a successful ICT department, a volunteer assisted in keeping ICT fee earnings separate from general school allocations and used the large pool of funds to update and expand the computers and lab. Over two years the school saw great success in student use and quality of the program. Unfortunately this success created resentment among teachers. One problem was students skipping class to use computers during open lab time. Teachers were upset students would be more interested in computers than their lesson. The prosperity of the lab made teachers jealous and led to requests for a portion of the money. The lab was ultimately paying for its success as a semi autonomous unit. Like the ICT instructor who demonstrated incompetence in their position, this successful lab ultimately created a negative perception within the school due to the lack of involvement of all groups.

The reality is that schools in Uganda are poor, and any revenue generated for the school, either through boarding fees, ICT fees or government funds, need to be

stretched as far as possible. Another issue is that everyone expects to receive a part of this revenue. Teachers believe if they help make the school prestigious so that it can request higher fees, they should get monetary compensation. The ICT fee isn't exempt from their view of generated revenue.

Clever work by the administration and effective budgeting can satisfy each group in the school. The administration should be able to use some ICT monies to pay for costs associated with the computers. The electricity bill for the school, cost of printing supplies, cost of repairs and maintenance all can be paid from that fund. Money can be set aside for improvements to the lab, buying or upgrading computers, purchasing new software or items requested by teachers for use in the classroom. Ideally, this would be the bulk of the allocation, but at some point the need to purchase new computers and new software will diminish and this money can be re-budgeted. Last, money can be offered for teachers participating in professional development or promoting ICT use in the school. This can include using computers to enhance their own skills and material, producing materials and assessments for class, or integrating ICT-based lessons into their curriculum.

6.5 Decision Making

When funds become predictable in the school decisions will need to be made on what materials to purchase. Schools with excess money may decide to purchase an expensive item with little benefit to the school as a status symbol. The benefit in social capital rarely matches the monetary cost of having an underutilized showpiece. For example, when schools decide to upgrade from a manual duplicator to a printer, they may consider a multifunction Xerox copier rather than a desktop printer. Not only is the up front cost higher, but the cost of toner, electricity, and maintenance will be recurring. Maintenance poses a larger problem due to the accessibility of repairmen and parts. Uganda is a highly centralized country with most reliable resources in the capital. Each time the copier breaks the school would

have to transport the machine to Kampala or pay for a service person to visit the site, neither of which is inexpensive.

Other prestige purchases can be items for the lab, including expensive computer desks, rolling chairs, superficial improvements of the lab space like carpeting, and tailored dust covers for computers. Each of these items has inexpensive alternatives. Administrators may prioritize their own computers and resources, as a sign of position rather than putting user needs first. This type of spending creates even more resentment than spending the money on projects unrelated to ICT.

Schools may eventually decide to invest in connecting school computers to the Internet. The initial cost is expensive, but more importantly the school needs to anticipate the monthly fees and how they will fit into their budget. It may be worthwhile to question the necessity of the Internet at the school even though it isn't a showpiece purchase. There are advantages to having an Internet connection, but they may not be experienced immediately. Volunteers across the country lamented that the primary use of Internet at schools is personal use by teachers. The Internet could promote a positive attitude towards ICT use, but may also distract from the other resources already present. The schools were providing essentially the same benefit as a free Internet café.

Conversely one possible benefit is to offer the same service as an Internet café to members of the community. In rural towns with limited access to computers schools could offer times for the community to use their resources and generate additional income. The need for this service may soon decrease with the increase of access of cell phones. By early 2012 phones costing only 35,000 shillings ($17 US) came with web browsing capabilities, with data packages starting at 500 shillings ($0.25 US). With the rapid technological advances of phones and the increase in Internet access, phones may leapfrog personal computers and laptops in Uganda. Schools in the United States are already experimenting with cell phones in classrooms. Cell phones could become the next personal device used for education.

CHAPTER 7- CONCLUSIONS

The life of a school computer lab can be extremely tenuous. Successful projects are under constant scrutiny by those who feel left out. Fledgling programs can be pulled away from productive directions and beginning programs can stall due to different views held by decision-makers. Money, space, resources and control are all flashpoints for groups in the school community.

Many factors differ from school to school, making it impossible to advocate a single approach to effectively integrating ICT. Some schools have many staff members with computer training, while others have few. Many schools in rural settings have limited space. Others have a limited funding pool. A school may be large but the population can pay very little. Any solutions must recognize the individuality of each school and the importance of stakeholder ownership. Each school community needs to set its own policy and goals and develop its own system.

7.1 Policy

Based on my study of the climate for computer use in Ugandan schools, I will offer a set of questions that should be asked about the organization of a school's ICT policy. The questions are meant to stimulate discussion and debate, allowing each group-- users, staff, and administration--to voice their desires and goals. Ultimately each school community should develop a shared vision against which it can measure its progress. Benchmarks should be made to encourage forward thinking and guide development.

The first step for any school planning to integrate ICT into the classroom is to obtain computers. Fortunately, with the programs being implemented by the government of Uganda through the Ministry of Education and Sports and the Ugandan Communication Commission, bringing computers into schools is a greater reality each day. Many schools already have computers, thanks to a long history of donations and gifts from churches and NGOs. Where computers are absent from the

school, public understanding has reached a point where incorporating and justifying an ICT fee for students is quickly accepted by the parents. Parents understand the value ICT training offers their children making it easier to obtain fees and approvals.

Questions regarding money should include issues pertaining to all three groups in the school community. The groups will be able to discuss and agree on practices that satisfy their needs and prevent others from over reaching. The following questions are important to address and offer a minimum of discussion point about funding practice.

- How much should each student pay per term?
- What resources, activities, or services will be covered by this fund?
- How much money should be devoted to strictly improving the lab?
- How much money should teachers be paid to encourage ICT use?
- Will the money for teachers be a flat rate or dependent on their actions (attending professional development, extra incorporation, etc)
- Are funds going to be used to cover all electricity costs or just costs from the computers?

Answering these questions may lead to more questions about what the school sees for its future and the areas it values. The school can decide whether it wants to emphasize teacher adoption; acquiring more computers, resources or peripherals; or maintaining existing computer equipment. After a few terms or a few years the school can look at how the funds are being used and if any adjustments should be considered. Patterns of use change over time and having a set standard to measure past performance can clarify the changes needed.

Each group must then respect the created policy; users will agree to pay fees, staff will work on providing ICT use for students and administration will follow the budget allocations. Teachers should be able to access the funds when they meet the requirements. Users should be able to see improvements to the lab or hear from

their students that resources are being properly utilized. Disregarding a set budget and a clear plan is the simplest way to unsettle the school community.

Guidelines for usage and access for teachers and students are also important to establish. Access to resources was noted as a challenge for teachers and addressing it early can reduce the likelihood of access becoming a barrier. The following questions are integral in establishing the scope of roles and responsibilities for each school group.

- Who will be the primary person responsible for the lab and its contents?
- Who will decide what repairs need to be made and when?
- Who will be responsible for determining the resources purchased for ICT materials?
- Who has access to the lab?
- When will access to the lab be granted?
- Will there be computers specifically for the teachers?
- Will there be times when students are given priority to computers?
- Who will be responsible for a laptop and projector?
- Who will have access to the laptop and projector?
- What policies should be in place for printing?

Assigning responsibility to specific individuals for specific roles assists in accountability. All parties will know the expectations of others and, when problems arise, will use proper channels to solve the issues. Access to the lab is important to establish because it protects school resources. If anyone can have access at any time, items can go missing. If there are specific times and protocols, those items can be protected. Lastly, if teachers are expected to use computers, their efforts should be facilitated. Determining how many, where they are located and what they should be used for can all be outlined.

7.2 Teacher Adoption

Simply having a positive attitude of computers and positive perception about their use in a classroom increases the likelihood of adoption by teachers. Schools should find a way to help teachers develop that positive attitude. This step goes outside the Western approach of partitioning work and home actions. Teachers are rarely able to access computers outside a school and desire to use them in many of the same ways people in developed nations use personal computers. They want to be able to play music, watch videos, play games, and do personal work, including email or Facebook, if Internet is available. Limiting these actions is difficult and creates a negative perception with those who do have access to those options outside of the workplace. Ultimately the more familiar teachers are with actions they learn through personal use the more likely they are to use a computer in the classroom.

Teachers should be given access to computers, either a specific computer in the lab or a computer in the staff room, for personal use. Having a computer set aside for teachers' means they don't have to compete for time with students and gives them a sense of privacy. Storing information like tests, classroom materials and grades will also be more secure on a staff computer, as many teachers don't have personal flash drives or other storage devises. Managing this computer and assisting in teacher issues will be an additional responsibility for the ICT instructor.

Ideally the ICT instructor would be given an expanded role in the school and not simply be an instructor for students. Their work will include facilitating teachers' needs and providing assistance when ICT resources are going to be used in class. Assistance with learning programs, installing proper materials and trouble-shooting issues will be required. For this, the ICT teacher should be given an incentive plan, just as the teachers who use ICT in the classroom.

As the administration sets incentives, key questions need to be addressed. The school should decide what actions should be done using computers regardless of incentive. Tasks like tracking grades, ordering class rosters and typing department memos and meeting minutes are all basic enough that class teachers or

department heads can handle a shift in the tool used to produce this work. Producing classroom handouts or assessments may start as an incentivized job to promote transition from duplicating materials to using a printer, but eventually should become a basic expectation for the teaching staff.

Giving incentives for how many times a computer resource was used in class could be a direct method, but this could encourage an equally challenging issue of a teacher who simply shows items like slides and movies with little connection to the curriculum in order to generate additional income. This practice has been seen when offering remedial lessons, skipping regular class time to instead teach remedials and earn a bonus. A good guide could be how many times teachers work a lesson into their schemes of work and monitor execution. The Director of Studies is in charge of monitoring lessons taught and can ensure the lesson isn't out of touch with the requirements of the class.

The most concrete way may simply be to use funds to facilitate further learning of computers by the teaching staff. Paying extra compensation to attend staff development over the holiday, providing a weekend workshop or bonuses for work done outside of the school day all would promote participation. Each teacher can earn a base amount for work outside the classroom and additional bonuses based on their participation in further work.

In addition to promoting teacher use, the school can focus on other issues teachers cited as barriers to their use. How the school will provide adequate space for lessons, reduce class sizes to better service learners, and facilitate teacher use in the classroom, should be asked. These questions may also be settled through policy decisions, but if not they should be raised and incorporated into previous ideas. Continuous discussion of the goals and policies is essential to success.

7.3 Volunteer's Role

Volunteers in schools have a chance to promote good practices by the teachers and administration and encourage use of ideas already found in country.

Efforts should relate to the goals of the Ministry of Education and Sports and the desires of the community, rather than external ideas, to ensure project success. MOES has already done extensive outreach to promote computer usage, which means people don't have to start from scratch. Continuing and re-emphasizing ideas and goals can double the exposure and time dedicated to learning skills, understanding program capabilities and promoting ideas of use. This allows for using examples of successful programs already in place in the country to fortify support in local efforts.

Enthusiasm for computers can be both a blessing and a burden. People who are too enthusiastic about ICT potential and adoption may rush the process of implementation. Bringing in computers and starting with big ideas dictated to others can do more damage than a process that stalls. Other teachers may feel left out of the process and the users may not feel ownership in the idea. The project then becomes a personal project for a few people and builds resentment, as money and other resources are devoted to it. At the same time, enthusiasm may not be the same with all members. Keeping ideas fresh in teachers' and administrators' minds is important and will keep them engaged in ICT adoption. Reminding teachers how computers will benefit them or going back to activities to may help invigorate them. Parents of students may be hesitant, but engaging students can generate important excitement that carries over to their families. More and more people understand how computers will influence future jobs. Ultimately, enthusiasm is important because it will encourage people to share their voice in the decision making process.

As the discussion takes place, it is important that all three groups recognize all the issues that need to be addressed. When a committee or people come together to make decisions topics cannot be disregarded, as it raises the chance they won't be addressed. People need reminding how each point influences the future of the project. Volunteers must resist answering issues for the school, instead promoting further discussion and a decision from the school. Later, if the volunteer solution is used, they can blame an outside solution as not matching their values for problems

in the project. Volunteer ideas also take ownership away from the decision makers and prevent them from truly thinking about the impact each decision has.

It is likely the school will already have ICT resources before a volunteer arrives in a school. The initial steps will be to determine how they are used, areas the school is performing well, areas of improvement, and ideas for growth. Many schools will settle into a habit of use that satisfies a few people and excludes the rest. This could be the administration, the staff or the users who benefit most. The example of the successful ICT was also an example where teachers felt unsupported. This could result in teachers hijacking the project later. Other schools put the desires of administrators first before addressing the schools needs. Inviting people to reevaluate their school is difficult, but it can lead to great results.

7.4 Conclusion

If preventing under utilization relies primarily on teacher adoption, then the first two issues to address are training teachers in ICT skills and ICT resources. To encourage use teachers should be allowed to use computers for both personal and school related activities, generating a positive attitude towards ICT potential. The administration can facilitate the trainings through fund paid by users, who will benefit from the use of computers in instruction.

The administration will play a large part in making computers sustainable in the school through the creating and enforcement of policies. The policy creation should not be theirs alone, as both staff and users should contribute ideas to the uses of computers and funds paid to the school. Compromise is an important component, since ICT fees will need to be spread between issues of improving the computer lab, promoting teacher adoption and facilitating needs of the school.

Preventing under utilization and keeping the project sustainable, rely on the three groups of the school community. Users will challenge a fee if they don't have a say on how funds are spent. Administrators will be reluctant to offer staff incentives if they don't embrace ideas for adoption. Without support the staff can

develop a negative attitude towards ICT and ultimately not integrate ICT into their lessons. Creating strong, inclusive policies with ample support and encouragement for teachers can provide a framework for a successful school ICT integration program.

7.5 Further Work

There is potential for other studies to look at the impact of ICT integration has on syllabus coverage. When more schools are comfortable with and confident in their ICT resources and as teacher adoption increases. Measuring the impact of using ICT resources for various tasks such as producing classroom materials, teaching remedial lessons, or using ICT during classroom instruction compared to traditional instruction methods could be evaluated. This study could suggest new goals for teachers. A comparison of UNEB test scores from students taught using each form of instruction could be used to compare learning.

Additional work could also include a study of schools' decisions when implementing ICT. The study could examine whether administrators, teachers or users were given priority for resources and how those decisions impacted the school. The justification for each decision could be evaluated, and the choices could be identified as being positive or negative in reaching school goals. From this study a better framework of best practices could be provided for school adoption of ICT.

APPENDIX

A.1 Department Head Survey

Questionnaire for Head of Science Department

Please fill this survey completely and to the best of your knowledge. The information collected here will help to qualify any data points that may stick out. If you choose to complete this survey please **DO NOT WRITE YOUR NAME.**

1. What is the school population?
2. How many teachers do you have in the science department?
3. How many are government appointed? Locally recruited?
4. Have there been major changes to the school in the past three years?
5. Does your school have a dedicated lab block?
6. Are there specific teachers or subjects that have struggled or excelled? If talking about a teacher please refer only to the subject they teach and do not add their name.
7. How frequently are remedial lessons taught at your school?
8. Does your school have issues covering the complete Ugandan National Curriculum in chemistry, biology or physics before UNEB exams?

A.2 Preliminary Teacher Survey

Questionnaire for Secondary School Science Teachers

Please fill in all questions accurately and to the best of your knowledge. This survey is completely independent from the Ministry of Education and has no bearing on individual assessment. If you choose to fill out this survey please **DO NOT WRITE YOUR NAME.**

1. Write the subjects and grade levels you teach. (Ex; S1 Chemistry, S3 Biology)

2. For each subject and grade level, list the topics you have successfully covered to date. Please use the Ugandan National Curriculum to guide you in listing the topics.

3. Please state the factors that affect the amount of syllabus coverage in a normal term.

4. What changes would improve the syllabus coverage at your school?

5. Do you teach remedial lessons on weekends, after lessons or during holidays?

6. How frequently do you do instruction outside of the timetabled class time?

7. Are you a government appointed or locally recruited teacher?

A.3 Post Teacher Survey

ICT Inquiries

Does your school have ICT resources that can be used in science lessons?

Have you used the ICT resources yourself in a lesson?

If yes, how have you used them?

If no, what reasons have prevented you from using them?

Rank the possible reasons for not using the ICT resources:

___Unfamiliar with the ICT resources (programs, PowerPoints, Videos)
___Unfamiliar with how to use the technology (projector, laptop, etc)
___Unsure of how it matches with the curriculum
___Do not have the time for ICT integration
___Does not match the curriculum you teach
___Do not want to use ICT in your lessons
___Other (Please Specify) _____

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